SYNOPSIS OF THE PROJECT SANCTIONED UNDER KSCST 42\textsuperscript{nd} SERIES

1. Title of the Project: DEVELOPMENT OF CONCRETE USING IRON SLAG, GRANITE SLURRY AND POLYMER BASED ADDITIVE

2. Name of the College and Department: The National Institute of Engineering, Department of Civil Engineering

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4. Keywords: Iron Slag, Granite Slurry, Optimum mix proportion, Polymer based additive, compressive strength, Modulus of rupture

5. Introduction: The ever increasing cost of construction materials has imposed the scientific community to develop newer and cost effective building materials. Accordingly, several industrial by-products such as granite quarry slurry, which are largely left unused and are hazardous to human health and environment, steel slag from the Iron industries may serve as ideal alternates. Furthermore, these by-products can be effectively used in manufacture of concrete, as they are established to present several desirable properties. This study aims to arrive at the optimum proportions of partially substituting cement and sand with Granite slurry and iron slag respectively, with the addition of polymer based additive to achieve a better concrete properties, in terms of workability, strength and structural behaviours.

6. Objectives:
   a) To study the compression behaviour of the concrete prepared by partial replacement of cement and fine aggregate with granite slurry and iron slag respectively with various levels of replacement for different curing periods to arrive at the optimum mix proportion
   b) To study the compression behaviour of concrete prepared by optimum mix proportion of partial replacement of cement and fine aggregate with granite slurry and iron slag respectively, with varying percentages of polymer based additive
   c) To study the flexural behaviour to determine the Modulus of Rupture of concrete beams using optimum mix proportion of partial replacement of cement and fine aggregate with granite slurry and iron slag respectively, with and without polymer based additive.
7. Methodology:
   a) Determine the material characteristics of all the materials that are chosen as partial supplements as well as the conventional materials
   b) To workout different combination of the supplementary materials with varying levels of replacement
   c) Preparation of concrete and determining the workability characteristics as per the codal provisions.
   d) Casting cubes and determining the compressive strength in an Universal testing machine at different curing periods
   e) Selecting the best combination with optimum supplements that give a greater compressive strength
   f) To the Optimum mix proportion obtained polymer based additive is added at varying percentages and resulting concrete is tested for compressive strength to obtain optimum dosage of polymer based additive
   g) To determine the modulus of rupture of plain concrete beams of optimum mix proportion of partial replacement of cement and fine aggregate with granite slurry and iron slag respectively, with and without additives and subjecting them to flexure

8. Results:
   a) For combination C2 (7.5% granite slurry 20% iron slag)
      i) 22% increase in compressive strength at 28 days curing compared to design strength of M30 concrete
      ii) 20% increase in compressive strength at 46 days curing compared to design strength of M30 concrete
   b) For combination C9 (12.5% granite slurry, 25% iron slag)
      i) 14% increase in compressive strength at 28 days curing compared to design strength of M30 concrete
      ii) 16% increase in compressive strength at 46 days curing compared to design strength of M30 concrete
   d) Addition of Polymer to combination C9 – For 1% polymer addition there is 9% increase in compressive strength at 7 days curing; also workability of C9 is low which is increased by 53% by use of polymer based additive.

   NOTE: Further results on 28 days curing for polymer added optimum combination, Modulus of rigidity of the optimum mix proportion concrete are not determined during the time of writing this synopsis

9. Scope for future work:
   a) The percentage of partial substitution chosen are of 5% increments for better results, further smaller increments can be chosen which will give more accurate optimum mix proportions.
   b) Extensive studies on flexural behaviour under different loading conditions, reinforced sections can be conducted on the concrete prepared using combination C9